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T. O. NO. 08-10-126
A.P. 2275A

INSTRUCTION BOOK FOR OPERATION AND MAINTENANCE

OF

RADIO RECEIVER

BC-357-P

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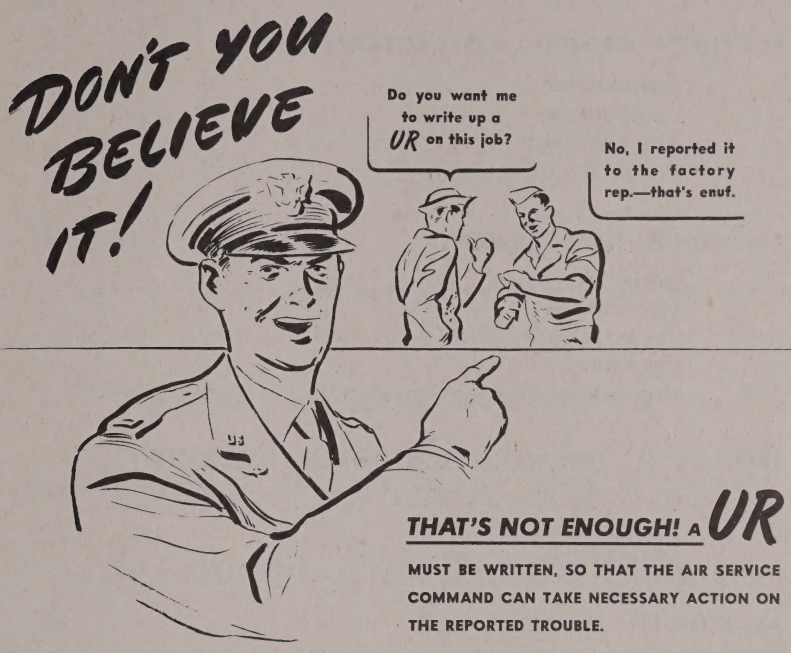

THAT'S NOT ENOUGH! A UR MUST BE WRITTEN, SO THAT THE AIR SERVICE COMMAND CAN TAKE NECESSARY ACTION ON THE REPORTED TROUBLE.

In filling out a UR (AAF Form No. 54) personnel should follow the instructions given in AAF Regulation 15-54. Particular care should be taken to include the following information:

1. ORGANIZATION AND STATION
2. NAME PLATE DATA
3. DATE AND NATURE OF FAILURE
4. TYPE OF AIRPLANE IN WHICH INSTALLED
5. RECOMMENDATIONS

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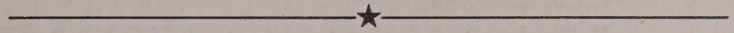

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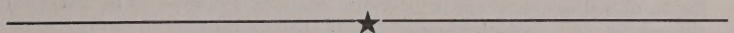

UNSATISFACTORY REPORT

FOR U. S. ARMY AIR FORCE PERSONNEL:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54, listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Airplane model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

FOR U. S. NAVY PERSONNEL:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Material (location to be specified) and the Bureau of Ships, Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes-no).
7. Remedy used or proposed to prevent recurrence.

FOR BRITISH PERSONNEL:

Form 1022 procedure shall be used when reporting failure of radio equipment.

DESTRUCTION OF ABANDONED MATERIEL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:-

1. Explosives, when provided.
2. Hammers, axes, sledges or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available arms.
5. Where possible, and when time permits, bury all debris or dispose of it in streams or other bodies of water.

Procedure:-

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring in electrical equipment. Smash gas, oil and water cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.

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SECTION 1.—GENERAL CHARACTERISTICS

1. Introduction

a. Radio Receiver BC-357-P is an ultra-high frequency radio receiver for aircraft. The frequency range of this receiver is from approximately 67 megacycles to approximately 85 megacycles. The purpose of the instrument is to receive 75 megacycle marker beacon signals used in the Army instrument landing system, the cone of silence and fan marker beacons of the Civil Aeronautics Authority, and other facilities employing modulated 75 megacycle horizontally polarized transmissions. The output indication is visual in the form of an indicator lamp flash on the instrument panel. The indicator lamp flashes in accordance with the keying of the signals of the C.A.A. markers and some Army markers, thereby identifying the transmitter. Early type Army Marker Transmitters are not keyed.

b. The sequence of operation upon the received modulated signal is as follows:

(1) Pick up by the half-wave antenna.

(2) Amplification at 75 megacycles, diode detection, and AF amplification by the first tube.

(3) Additional amplification and rectification of the audio signal by the second tube to produce the direct current for operation of the relay which controls the lamp circuit.

2. Components

a. Radio Receiver BC-357-P consists of the component parts which are shown in the following table:

Quan.	Description	Dimensions	Unit Wgt.
1	Book, Instruction, for Radio Receiver BC-357-P	8½" x 11"	0.37
1	Mounting FT-161	5½" x 5⅞" x 1½"	0.5
1	Radio Receiver BC-357-P Less Mounting	5⅜" x 5 ⅜" x 3⁷⁄₁₆"	2.65
1	Tube VT-153	3¼" x 1⅜"	0.071
1	Tube VT-104	2⅝" x 1⅜"	0.065
		Total Weight	3.656

3. Total Weight

The weight of Radio Receiver BC-357-P is 3.265 lbs.

4. Power Requirements

Radio Receiver BC-357-P receives its low and high voltage power from the radio compass power supply and is controlled simultaneously with the latter by the radio compass ON-OFF switch. The power requirements are .158 ampere at 24 volts for the low voltage supply and 4.5 milliamperes at 220 volts for the high voltage supply. There is an intermittant low voltage drain by the indicator lamp.

SECTION II.—EMPLOYMENT

5. Initial Procedure

a. Check to determine whether all the items which appear upon the list of component parts in paragraph 2, page 1, are available.

b. Insert the tubes in the proper sockets and make sure that the contact pins are in full engagement with the socket contacts. Insure firm contact for the grid lead to the first tube.

c. Examine receiver carefully for mechanical defects.

6. Installation

General. The same general considerations apply to the installation of Radio Receiver BC-357-P as to other radio equipment in aircraft. The wiring must be shielded and bonded. The specifications and requirements for shielding and bonding as set forth in Army Air Corps technical orders must be adhered to in installation of this receiver.

7. Preparation For Use

a. After the receiver has been installed and all connections made, proceed as follows:

(1) Turn on the radio compass. This supplies the power for Radio Receiver BC-357-P. Wait about one minute for the tubes to warm up.

(2) Apply a test signal to the receiver and check the tuning. This is done with Test Set I-76. (Consult the Instructions for Test Set I-76). Proceed as follows: Place Test Oscillator BC-376-H (Part of Test Set I-76) on the ground to the side of the aircraft about 10 to 20 feet from the marker beacon receiving antenna. The test oscillator radiator should be extended to its full length and set parallel with the marker beacon antenna. The oscillator battery switch should be turned ON and the MODULATION SWITCH set for 3,000 cycles. (3) Connect Test Indicator BE-67, which is also part of Test Set I-76, to the output of the receiver by plugging one end of the cord provided with the test set, into the jack on the front of the receiver marked RELAY, and the other end of the cord into the jack of the test indicator. Set the switch on the test indicator to the TUNE RECEIVER position, and the milliameter will indicate the output current of the radio receiver when the latter is properly aligned and normal. If no indication be obtained, check the oscillator and refer to the instructions pertinent to adjustment of that instrument. (4) Use a screwdriver with 1/8" blade for tuning the ANT. and DET. tuning capacitors of Radio Receiver BC-357-P. Tune for maximum response on the test indicator. Tune in this order: DET. ANT. DET. If the output exceeds 0.5 ma, at the maximum response, decrease the length of the antenna on the test oscillator by collapsing the sections or place oscillator at a more remote point. Rotation of the oscillator will also accomplish the same result. There should be no moving object in the vicinity of the test oscillator or the radio receiver antenna while the tuning adjustment is in progress. This tuning adjustment should always be made with the receiver chassis in its case.

b. Remove the test signal and check relay as follows: (1) Hold the switch on Test Indicator BE-67 in the ADJUST RELAY position. (2) Turn the control knob on the test indicator clockwise until the radio receiver indicator light goes on and then turn the knob back until the light goes off. The relay should close at 0.4 milliampere (—0+10%), as read on the meter in the test indicator, and open at 0.2 milliampere (—0+10%). The procedure outlined in paragraph 18 under MAINTENANCE should be followed if the relay needs adjustment. (3) After test indicator has been disconnected the receiver is ready for operation. (4) Turn the test oscillator ON and observe that the indicator lamp on the instrument panel lights after the test indicator has been removed. This checks the jack circuit for proper closing after the plug has been removed.

8. Operation

a. Radio Receiver BC-357-P will respond to any 75 megacycle signal which is horizontally polarized and modulated at an audio rate, responding with increasing sensitivity as the modulation frequency increases up to 3,000 cycles. A signal many times greater is required at 60 cycles modulation than at 3,000 cycles modulation to give normal output. The receiver has thus been designed because the 60 cycle modulated transmitter used in the Army instrument landing system is too powerful for use with the sensitive receiver required for cone of silence operation.

b. The interval during which the marker beacon indicator lamp will indicate varies from a few seconds to as long as several minutes and depends upon the type of marker, altitude and speed of the airplane. Cone of silence markers utilize non-directional antenna arrays which cause equal indications for any direction of flight. Indications over cone of silence markers last about 1 minute at 10,000 feet altitude, when the speed of the airplane is 150 miles per hour.

c. In order to eliminate false or confusing signals, the receiver is designed so that stray radiations, natural or man-made static, ignition interference or vibrations shall have a minimum effect.

d. The actual operation of the receiver requires only that the compass switch be turned ON. No other adjustments are required while the receiver is in use.

9. Precautions During Operation

a. The following precautions should be observed during the operation of the receiver in order to avoid faulty use and misinterpretation of results:

1. The radio compass switch should be in the ON position.

2. When passing over a marker the indication should be steady or flash regularly, following the keying of the transmitter. Cone of silence markers and some Army instrument landing markers are not keyed. Fan type markers and C.A.A. instrument landing markers are identified by keying. However, the radio receiver may not follow the keying of the 100 watt fan marker transmitters when the airplane is passing through the strongest part of the beam at low altitude.

3. Flickering of the indicator lamp may be caused by a defect in the antenna installation, microphonic tubes, or ignition interference.

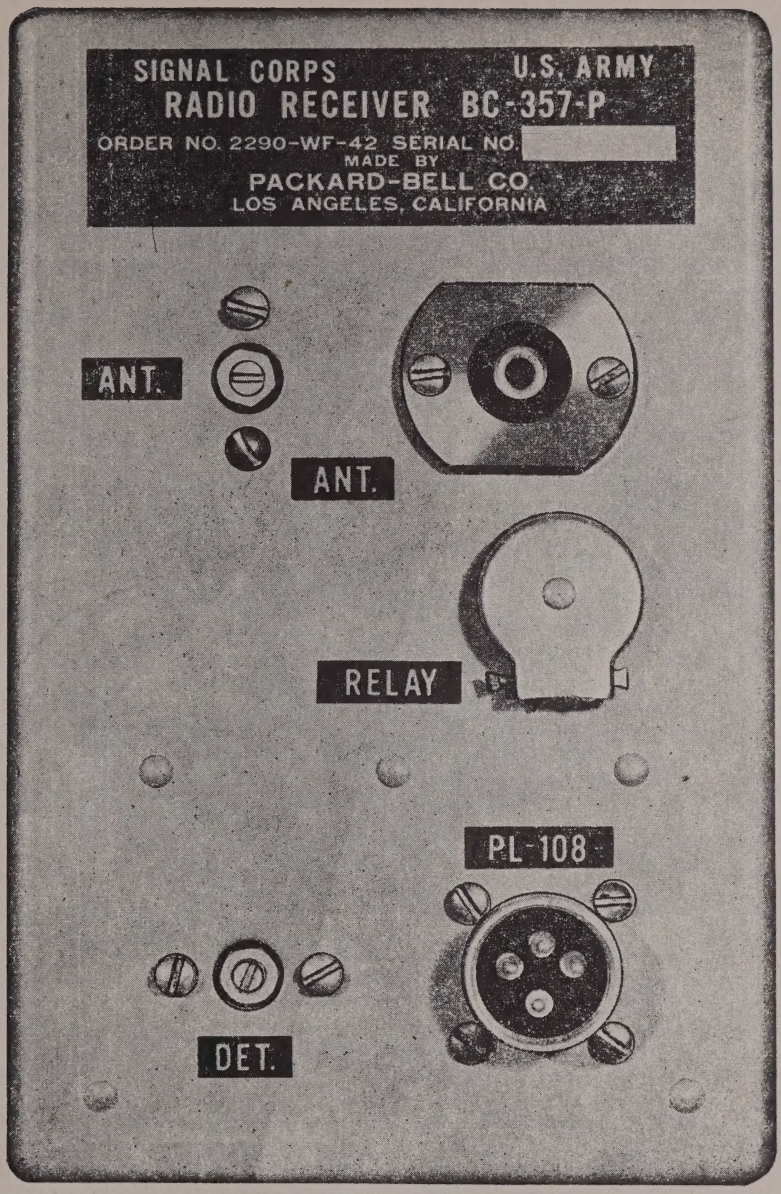


FIG. 2 RADIO RECEIVER BC-357-P, FRONT VIEW OF PANEL

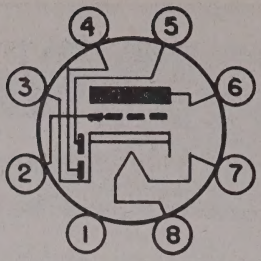


FIG. 3 TUBE VT-104, DUPLEX-DIODE TRIODE
BOTTOM VIEW

(1) METAL SHELL CONNECTION
(2) CONTROL GRID
(3) CATHODE
(4) (5) DIODE PLATES
(6) PLATE
(7) (8) HEATER

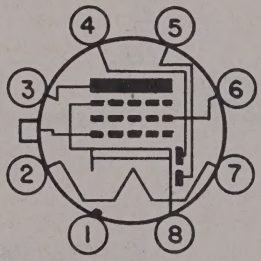


FIG. 4 TUBE VT-153, DUPLEX-DIODE PENTODE
BOTTOM VIEW

(1) METAL SHELL CONNECTION
(7) (2) HEATER
(3) PLATE
(4) (5) DIODE PLATES
(6) SCREEN GRID
(8) CATHODE

CONTROL GRID CONNECTED
TO CAP OF TUBE

SECTION III.—DETAILED FUNCTIONING OF PARTS

10. Radio Receiver BC-357-P

a. Radio Receiver BC-357-P is a two-tube ultra-high frequency receiver having the following tube complement: Tube VT-135 duplex diode pentode, and Tube VT-104 duplex diode triode. The complete receiver is shown in Figures 1, 2, 5, and 6. By means of a reflex circuit Tube VT-153 functions as a radio frequency amplifier, detector, and audio frequency amplifier. Tube VT-104 functions as an audio frequency amplifier and rectifier, which supplies the relay current.

b. Referring to the schematic diagram figure 8, the 75 mc signal picked up by the antenna is fed to the antenna input transformer through a coaxial transmission line. This r-f signal voltage is stepped up by auto transformer action of coil (5) and appears across terminals of capacitor (9) which tunes circuit to resonance. The r-f voltage is impressed on grid of Tube VT-153, across resistor (16-1) through coupling capacitor (10), resistor (16-2) is effectively by-passed at radio frequencies by capacitor (29). The r-f variations in plate current of Tube VT-153 produces an R. F. voltage across choke (7-1) which is impressed on the diode plate through capacitors (11-1) and (11-2). The anti-resonant circuit of coil (6) and capacitor (28) provides additional selectivity. The r-f signal is rectified by the diode of Tube VT-153 and the audio voltage is developed across the diode load resistor (17). Radio Frequency voltage is effectively blocked at this point by r-f choke (7-2). This audio voltage is coupled back to the grid of Tube VT-153 through capacitor (13-2) and resistor (16-2). Resistor (16-1) can be considered to be in series with the control grid when the tube functions as an audio amplifier. The audio frequency variations in plate current flow through audio choke (8-1) and resistor (22) developing an audio frequency voltage which is impressed on grid of Tube VT-104 through coupling capacitor (13-1). This is amplified by Tube VT-104, and the amplified voltage appears across audio choke (8-2) which forms the plate load. This voltage is impressed on the diode plates of Tube VT-104 by means of capacitor (15), and the coil of the relay (23) functions as the diode load. The rectified plate current flowing through the relay coil operates the relay, the contacts of which close the circuit of the indicator lamp.

c. At ultra-high frequencies it is necessary to regard the wiring of the r-f circuits as an appreciable part of the circuit constants. For this reason whenever parts are replaced another receiver or the photographs in the instruction book must be used as a reference and the exact lengths and positions of the leads duplicated.

d. (1) The space current (plate current plus screen current) of Tube VT-153 flowing through resistor (19) supplies the grid bias for the tube. By-pass capacitor (12-2) and resistor (17) create a slightly degenerative effect at audio frequencies.

(2) Resistor (20) and capacitor (14) act as a filter circuit in the high

voltage supply to Tube VT-153. This filter serves to prevent "hash" or "ripple", which might be present in the high voltage supply, from operating the relay. The characteristics of filter (20), and (14), are such as to render negligible the effect of 3 volts of audio ripple in the band 40 cps to 3,000 cps, in the high voltage supply. The audio frequency which appears in the plate circuit return of the radio compass may contain the modulation of the received signal as well as a component of the modulator in the radio compass, the latter appearing when OFF COURSE.

(3) The screen grid potential is supplied through resistor (18). Capacitor (12-1) functions as a by-pass for the screen grid circuit.

e. Compensation for changes in temperature is provided by capacitors (10), (11-1), and (11-2), which are of the temperature compensating ceramic type.

f. Both Tube VT-153 and Tube VT-104 have 12.6 volt heaters. These heaters are connected in series in this receiver.

g. Relay BK-35 (23), is shown in Figure 7. The closing current is 0.4 ma (—0+10%). Release occurs when the current drops 0.2 ma (—0+10%). (See paragraph 18 under MAINTENANCE for adjustment instructions.) A_1 and A_2 are the terminals for the relay coil windings. B_1 and B_2 are the terminals for the secondary circuit which the relay closes to operate the marker beacon indicator lamp. Terminal B_3 is not used.

h. Tuning adjustments are made by varying capacitors (9), and (28). These are marked ANT. and DET., respectively on the front panel. The positions of these capacitors are shown in Figure 2.

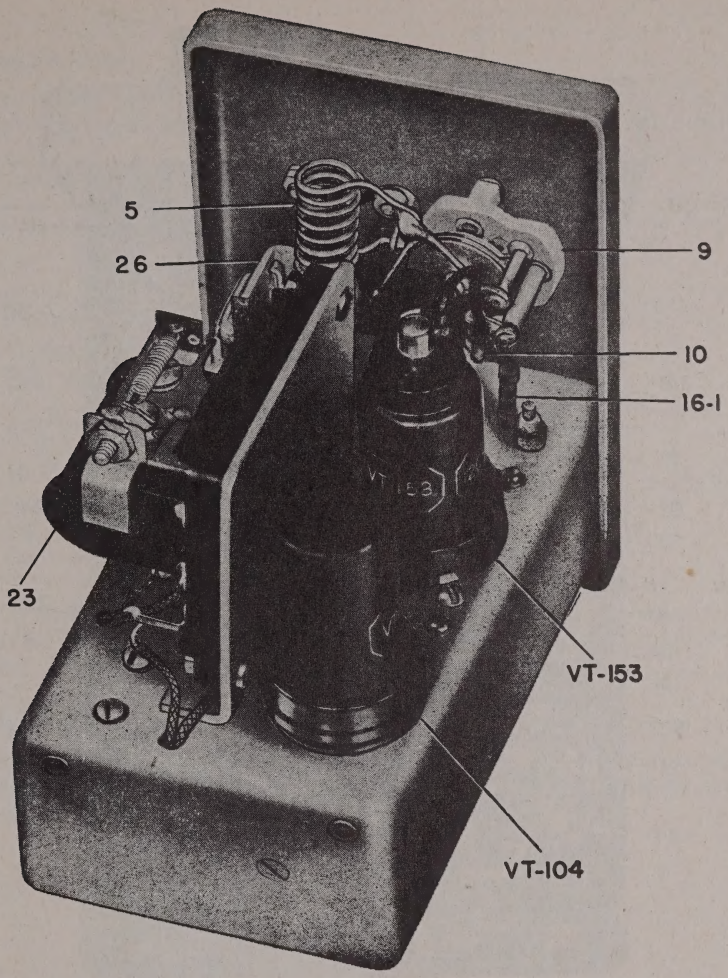


FIG. 5 RADIO RECEIVER BC-357-P, TOP VIEW OF CHASSIS

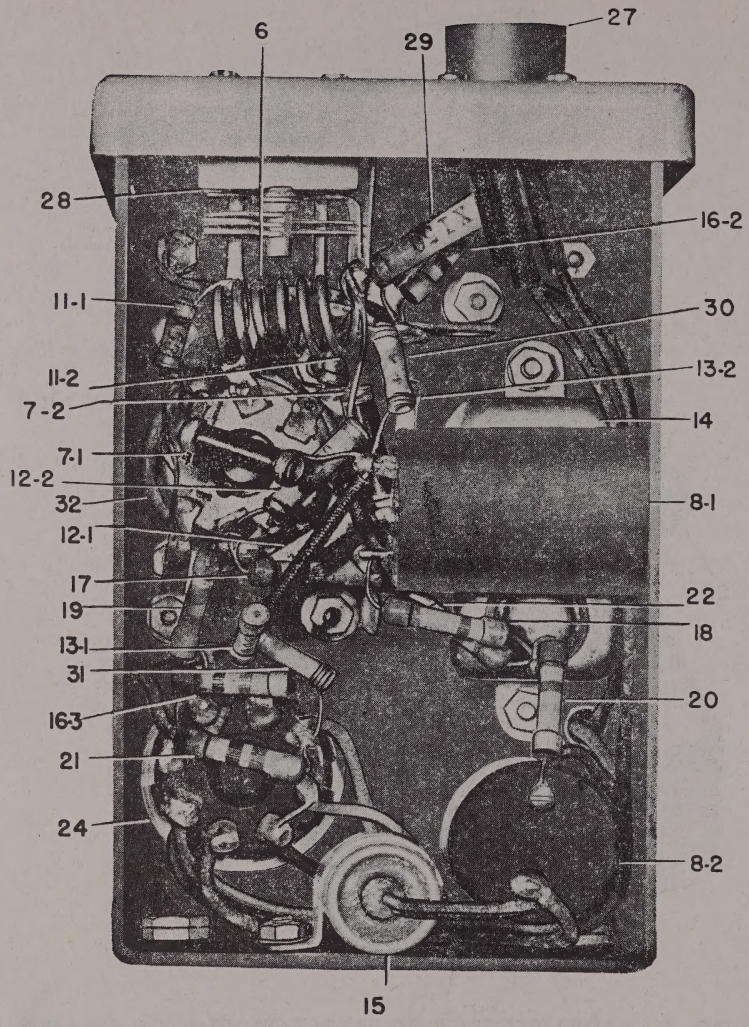


FIG. 6 RADIO RECEIVER BC-357-P, BOTTOM VIEW OF CHASSIS

11. Vacuum Tubes

Two tubes are employed in Radio Receiver BC-357-P. The functions and characteristics of the vacuum tubes required appear in the table below:

TUBE	VT-153	VT-104
Function	Pentode, R. F. Amp. Diode Det. 1st A. F. Amplifier	2nd Audio Amp. Diode Det.
Heater V.	12.6	12.6
Heater A.	.15	.15
Esg V.	125 max.	—
Ep V.	250 max.	250 max.
Ecg V.	—3	—2
Ip ma.	9.0	0.9
Isg ma.	2.3	—
Rp ohms	650,000 normal	91,000
Gm umhos	1125	1100

NOTE: *These data are the characteristics of the tubes as listed commercially and except for heater voltage do not indicate the actual potentials in operation in the equipment.*

12. Plug PL-108

This plug serves to connect the power supply, and the marker beacon indicator lamp leads, which are all contained in a single conduit, to the marker beacon receiver.

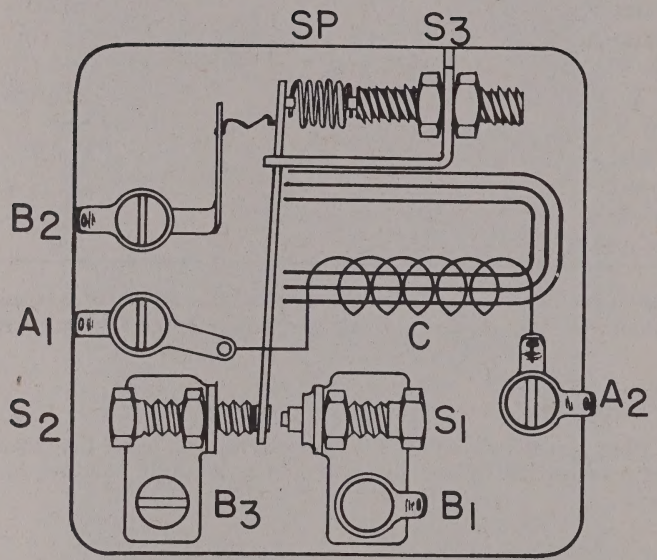
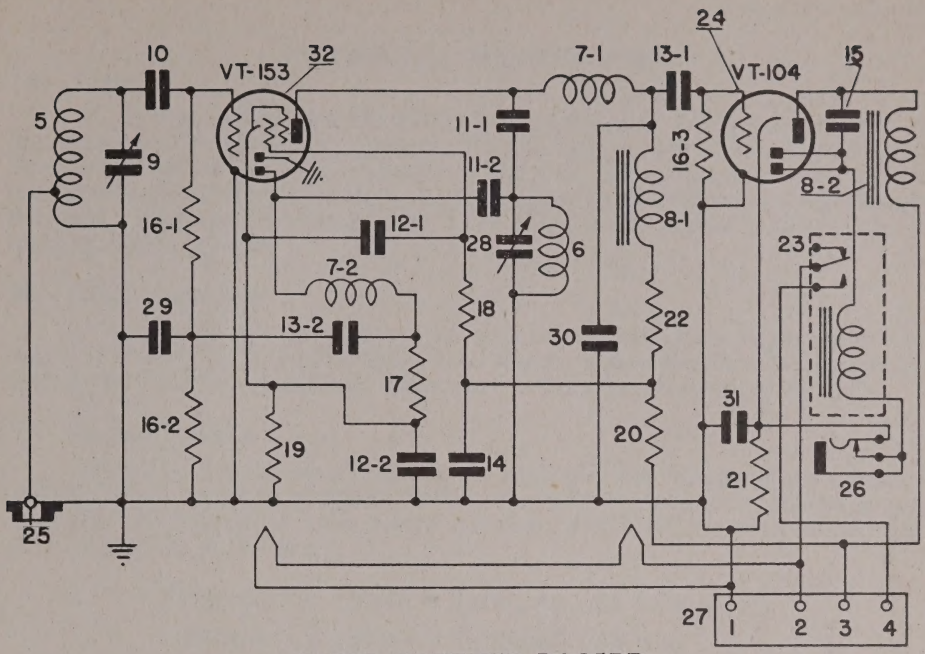


FIG. 7 RELAY BK-35, FUNCTIONAL DIAGRAM



RADIO RECEIVER BC-357-P

1 Common Negative
2 24-Volt Positive
3 220-Volt Positive
4 To Indicator Lamp
5 Ant. Input Transformer
6 Detector Tuning Coil
7 R-F Choke (2 Required)
8 Audio Choke (2 Required)
9 Tuning Capacitor, 17 MMF.
10 Capacitor, Ceramic 15 MMF.
11 Capacitor, Ceramic 50 MMF. (2 Req'd)
12 Capacitor, Ceramic 0.004 MFD. (2 Req'd)
13 Capacitor, Ceramic 1500 MMF. (2 Req'd)
14 Capacitor, Paper 0.5 MFD. 400 V.
15 Capacitor, Paper 0.034 MFD. 600 V.
16 Resistor, 1 MEGOHM ¼ W. (3 Req'd)
17 Resistor, 560,000 OHM ¼ W.
18 Resistor, 270,000 OHM ¼ W.
19 Resistor, 560 OHM ¼ W.
20 Resistor, 22,000 OHM ½ W.
21 Resistor, 1000 OHM ¼ W.
22 Resistor, 6800 OHM ¼ W.
23 Relay
24 Tube Socket
25 Antenna Jack
26 Relay Jack
27 Socket SO-88
28 Detector Tuning Capacitor, 17 MMF.
29 Capacitor, Ceramic 150 MMF.
30 Capacitor, Ceramic 75 MMF.
31 Capacitor, Ceramic 500 MMF.
32 Tube Socket

FIG. 8 SCHEMATIC CIRCUIT DIAGRAM, RADIO RECEIVER BC-357-P

SECTION IV.—MAINTENANCE

13. General

Since Radio Receiver BC-357-P is an ultra-high frequency receiver it imposes greater restrictions on maintenance and requires more particular servicing than do ordinary tuned radio frequency receivers. However, since this receiver is relatively simple and insensitive, the precautions to be observed are few though stringent. The circuits connected to Tube VT-153 are highly critical with respect to replacing parts.

14. Flight Inspection

This receiver should be given an inspection before every radio flight (except that it may be omitted on short local flights in fair weather) in accordance with approved Army Air Force inspection routines for receivers of this type.

15. Supply Voltages

Plug PL-108 permits a check on the high and low voltage supply which is obtained from the radio compass. When the radio compass is in operation and Plug PL-108 is removed from Radio Receiver BC-537-P, the voltage measurements should be as follows:

Terminals 1-2 (Positive Terminal) 24 volts

Terminals 1-3 (Positive Terminal) 220 volts

These are typical values and depend upon the battery voltage and type of compass. The high voltage will vary depending upon the regulation of the voltage supply circuit for the radio receiver. The use of a 45,000 ohm resistor as a load will simulate the high voltage drain of the receiver. The correctness of voltage distribution in the receiver in operation is assured by the determination of the proper values of the components and tubes and supply voltage.

16. Continuity Tests On Radio Receiver BC-357-P

a. Plug PL-108 and the vacuum tubes should be removed from their sockets when making continuity tests.

b. Check resistors at their terminals since none are shunted by other components excepting capacitors. Failure to obtain values indicated on circuit label indicates a defect in the resistor or breakdown of the adjacent capacitor. Adjacent capacitors should be checked immediately for short circuits.

c. Capacitors should register a small "kick" of the ohmmeter needle. This "kick" is due to the surge of the charging current, and is an indication of the size of the capacitor and that it has not become open circuited. The "kick" will be observed only with values on the order of .01 mfd. The steady value at which the ohmmeter needle comes to rest after this "kick" is the indication of resistance. Where the capacitor is not shunted by a resistor, this value should be beyond the upper limit of the ohmmeter on its highest range, the actual value being between

1000 and 10,000 megohms. Due to the resistances shunted across their terminals, capacitors (10), (29), (11-2), (12-2), (13-2) and (31) will show d-c resistance readings of 2 megohms, 1 megohm, 0.56 megohm, 560 ohms, 1.5 megohms and 1000 ohms, respectively.

d. Antenna input transformer (5) and inductor (6) should be inspected visually to insure that the soldered connections are satisfactory and that the spacing between turns is uniform. The grid lead to Tube VT-153 should be examined for broken strands and replaced if necessary. The grid clip should hold the grid cap with a firm grip. The R. F. chokes (7-1 and 7-2) may be checked by direct measurement across the terminals. The resistance of each coil is approximately 3 ohms.

e. Relay continuity tests comprise resistance measurement of the coil which has a nominal value of approximately 13,500 ohms and may be measured at terminal A_1 and A_2 as shown in figure 7. Contact resistance should be measured between terminals B_1 and B_2 and be negligible when the contacts are closed by light pressure on the armature.

f. Audio frequency chokes (8-1) and (8-2) have a D. C. resistance of approximately 1,800 ohms.

17. Tube Testing

The following chart gives data for testing tubes on the Model 685 tube checker. (See Paragraph 3 of "Detailed Tests on Radio Sets," Section III of Instruction Book for Test Set I-56-A). Observe gas currents whenever possible.

Tube	Filament Selector	Tube Selector	"IN" Position
VT-153 Pentode Sec.	8	40	BEF
VT-153 Diode Sec.	8	0	C
	8	0	D
*VT-104 Triode Sec.	8	41	BF
*VT-104 Diode Sec.	8	0	C
	8	0	D

*NOTE:—*When testing Tube VT-104, Adapter "B" must be used in the octal socket of Model 685 tube checker.*

Bear in mind that the best indication of tube condition is performance of the receiver.

18. Relay BK-35 Adjustment

(a) Reference is made to figure 7.

(b) Insert a sheet of paper of 2 or 3 mils thickness between the armature and relay coil pole pieces. Release screw S_1 and exert a slight pressure on the

armature directly above the pole piece. Turn screw S_1 until contact is just made and indicator light goes "ON." Lock screw S_1 in place, compensating for effect of lash in threads. Still exerting very light pressure against the armature, make sure that the paper can be withdrawn without excessive rubbing. This insures that there is no flexing of the armature and that the air gap is 2 or 3 mils. Adjust the tension of the armature spring SP by means of screw S_3 until release occurs at 0.2 milliampere (—0+10%) of relay current. Lock Screw S_3. Screw S_2 should now be adjusted so that the relay closing current is 0.4 milliampere (—0+10%). A deviation of plus ten per cent is allowable for both closing and release currents. However, it is important that the difference between the two should not be less than 0.2 milliamperes for best performance in service.

19. Inductors

a. The antenna input transformer and RF inductors employed in Radio Receiver BC-357-P are four in number, bearing designations (5), (6), (7-1) and (7-2) on the circuit label. The following table indicates the functions and dimensions of these coils:

Inductor	Use	Description
5	Antenna Input Transformer	7 turns air wound. ⅜″ ID Length of winding 13/16″ Ant. tap approx. 1 turn above chassis gnd. Wire #14 B&S gauge Tinned Copper
6	Detector Tuning Coil	5½ turns #14 B&S gauge Tinned Copper ⅝″ long, ⅜″ ID
7	R. F. choke	Winding 17/32″ long, #37 B&S enamel close wound on .180″ D Ceramic

b. The a-f inductors employed in this receiver are two in number, bearing designations (8-1) and (8-2) on the circuit label. These inductors are plate chokes for Tubes VT-153 and VT-104, respectively. The rating of these chokes is 23 henries with 3 ma d-c flowing through them.

20. Radio Receiver BC-357-P Characteristic Measurements

a. Sensitivity.—The sensitivity of this receiver is measured by the application of a 75 megacycle signal through a 75 ohm dummy antenna load from a signal generator, such as Ferris Microvolter Model 18-C. The dummy antenna may be a General Radio type 663-S, or an IRC type BT-½ 75 ohm resistor. The resistor must be connected by the shortest length of lead to the ANT. jack (25),

preferably by means of a Jones type 101-D plug. The signal generator must be modulated from a suitable external source according to the instructions pertaining to the signal generator employed. A General Radio type 713-B Beat Frequency Oscillator has been found satisfactory. A 30 per cent modulated signal is required for the sensitivity measurement. The normal sensitivity of this receiver varies between 1000 and 2250 microvolts, input at 3,000 cps (30 percent modulation). This is the test input which is required to produce a 0.4 ma standard output from the receiver. The performance of this receiver for instrument landing with the Army marker beacon transmitters, should be judged by the sensitivity of the receiver with a 60 cps modulated signal. The normal sensitivity of the receiver for a 60 cps, modulated signal varies between 15,000 and 50,000 microvolts, measured as outlined above. The relay should not operate with less than a 15,000 microvolt, 60 cps modulated signal applied to the receiver. With three volts audio frequency (40 cycles to 3,000 cycles) applied in series with the 220 volt supply the relay current should not be greater than 0.1 ma and will normally be about .03 ma.

b. Selectivity should be measured as follows:

(1) Tune the receiver accurately to resonance at 75 megacycles, using 30 per cent modulation at 3,000 cps. Adjust the signal input, using a dummy antenna, to the level required for an output of 0.4 ma. This should indicate normal receiver sensitivity.

(2) Set the signal generator frequency at about 70 megacycles and increase the input level twofold.

(3) Increase frequency slowly until the receiver output is again 0.4 ma. Read frequency at this point.

(4) Continue to increase frequency beyond resonance until the receiver output falls to the standard value of 0.4 ma. Read the frequency at this point.

(5) The difference between values recorded in (3) and (4) is the bandwidth at twofold (6 db) input.

(6) Repeat the above procedure but increase the signal level 31.6 times in step (2). The bandwidth now obtained is for a 31.6 times, (30 db), increase in signal level.

(7) The measured values of bandwidth should be within the following values:

Input	Bandwidth
2 x value at resonance (6 db)	0.6 to 1.2 megacycles
31.6 x value at resonance (30 db)	4.5 to 7.5 megacycles

21. Interstage Measurements

Audio frequency measurements are given in the following table, which

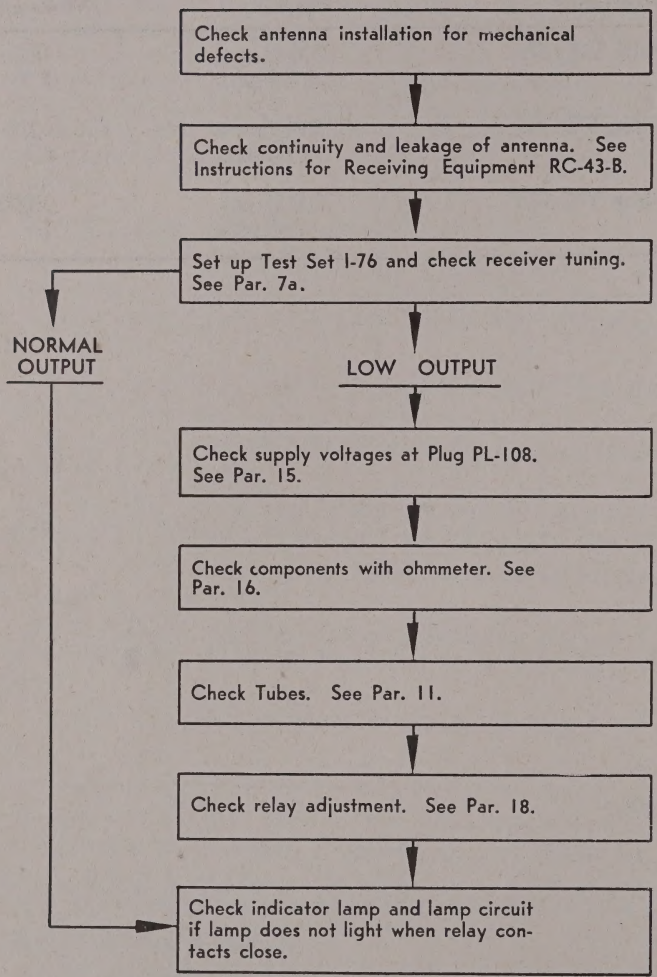
indicates the nature and value of the signal required to produce a receiver output current of 0.4 ma and the point of application of the test voltage. The test voltage is given with respect to the chassis. Shielded leads and an isolation condenser of .1 mf. should be used

Point of Application	Nature of Signal	Volts Req'd for 0.4 ma op.
Grid of Tube VT-104	3,000 cps	.38
	60 cps	1.7
Plate of Tube VT-153	3,000 cps	.42
	60 cps	6.4
Grid of Tube VT-153	3,000 cps	.0023
	60 cps	1.7

TROUBLE LOCATION AND REMEDY CHART

SERVICE ROUTINE

Equipment Not Satisfactory In Flight


Check antenna installation for mechanical defects.
Check continuity and leakage of antenna. See Instructions for Receiving Equipment RC-43-B.
Set up Test Set I-76 and check receiver tuning. See Par. 7a.
NORMAL OUTPUT
LOW OUTPUT
Check supply voltages at Plug PL-108. See Par. 15.
Check components with ohmmeter. See Par. 16.
Check Tubes. See Par. 11.
Check relay adjustment. See Par. 18.
Check indicator lamp and lamp circuit if lamp does not light when relay contacts close.

SECTION V
TABLE OF REPLACEABLE PARTS

MODEL: RADIO RECEIVER BC-357-P

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NO.
5	3CK302-5	COIL: antenna; 8 turns #14 tinned copper wire; self-supporting; length 11/16"; outside diameter ½"	Antenna tuning	Pfleger Lab. 31A111	PB-43-19
6	3CK302-6	COIL: r-f tuning; six turns #14 tinned copper wire; self-supporting length 7/16"; outside diameter ½"	Detector tuning	Pfleger Lab. 3D100	PB-43-20
7-1	3CK343-3	COIL: r-f choke; 15.4 microhenries; 115 turns #37 enameled wire wound on a ceramic form ¾" long x 3/16" diameter	Plate choke VT-153	Muter Co. 3-1C101	PB-43-35
7-2		COIL: same as 7-1	Diode choke VT-153		
8-1	3C316-16	COIL: audio choke; 28 henries; 3000 ohms d.c; single section; 6692 turns #42 enameled wire on iron core	Plate choke VT-153	Peerless Elec. 95-G-2	PB-43-33
8-2		COIL: Same as 8-1	Plate choke VT-104		
9	3DK9017V-3	CAPACITOR: variable air trimmer; 1 section; 17 mmfd; 2 stator and 3 rotor plates, ceramic insulation; aluminum plates; rotors on top	Antenna tuning	Radio Condenser model 34-5	PB-43-22
10	3D9015-10	CAPACITOR: fixed; ceramic; 15 mmfd, ±20%; 500 v d.c. working; negative temperature coefficient	Antenna grid coupling	Muter 13N680	PB-43-43
11-1	3D9050-48	CAPACITOR: fixed; ceramic; 50 mmfd, ±20%; 500 v d.c. working; negative temperature coefficient	1st plate coupling	Muter 13N680	PB-43-44
11-2		CAPACITOR: same as 11-1	Diode coupling		
12-1	3DKA4-39	CAPACITOR: fixed; ceramic; 4000 mmfd, ±10%; 500 v d.c. working; zero temperature coefficient	Screen grid by-pass	Muter 35K1200	PB-43-45B
12-2		CAPACITOR: same as 12-1	Cathode by-pass		

TABLE OF REPLACEABLE PARTS

MODEL: RADIO RECEIVER BC-357-P

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NO.
13-1	3DKA1.500-16	CAPACITOR: fixed; ceramic; 1500 mmfd, ±10%; 500 v d.c. working; zero temperature coefficient	2nd audio coupling	Muter 20K1200	PB-43-46
13-2		CAPACITOR: same as 13-1	1st audio coupling		
14	3DKA500-95	CAPACITOR: fixed; paper; 500,000 mmfd, +15—10%; 400 v d.c. working; oil impregnated; metal case; single terminal on top with solder lug	Filter	Electric Util. 10604	PB-43-31
15	3DA34-1	CAPACITOR: fixed; paper; 34,000 mmfd, 680 v d.c. working; tubular metal case 1 5/16" high x ⅜" dia; axial wire leads	Audio coupling	Electric Util. 10601	PB-43-32
16-1	3Z6801-39	RESISTOR: fixed; composition; 1 megohm, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	R-F grid	Centralab 710	PB-43-36
16-2		RESISTOR: same as 16-1	1st audio grid		
16-3		RESISTOR: same as 16-1	2nd audio grid		
17	3ZK6756-10	RESISTOR: fixed; composition; 560,000 ohms, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	Diode load	Centralab 710	PB-43-37
18	3ZK6727-21	RESISTOR: fixed; composition; 270,000 ohms, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	Screen supply	Centralab 710	PB-43-38
19	3ZK6056-11	RESISTOR: fixed; composition; 560 ohms, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	Cathode	Centralab 710	PB-43-42
20	3ZK6622-24	RESISTOR: fixed; composition; 22,000 ohms, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	Plate load	Centralab 710	PB-43-39
21	3Z6100-91	RESISTOR: fixed; composition; 1000 ohms, ±10%; ½ watt; ceramic insulation; ⅜" long x ⅛" dia; axial leads	Cathode	Centralab 710	PB-43-40

TABLE OF REPLACEABLE PARTS

MODEL: RADIO RECEIVER BC-357-P

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NO.
22	3ZK6568-19	RESISTOR: fixed; composition; 6800 ohms, ±10%; ½ watt; ceramic insulation; ⅝" long x ⅛" dia; axial leads	Plate supply	Centralab 710	PB-43-41
23	2Z7633-35	RELAY: BK-35; single pole; 2-position; 0.4 energizing mils or more; normally open; contact rating 24 volts at 0.4 amp; single coil; d-c resistance 13,000 ohms, ±10%	Indicator lamp circuit	GM Labs BK-35	BK-35
24	2Z8799-137	SOCKET: tube; octal; bakelite; 1¼" O.D.; mounted by locking ring 1 3/16" O.D.; fits into a 1 5/32" dia. hole; overall depth ¾"	Socket for VT-104	Cinch 9879	PB-43-27
25	2Z3095	RECEPTACLE: chassis; single socket type contact 11/16" long, drilled for solder connection on outer end and mounted in a phenolic disc ¾" dia. x 1/16" thick fitted into recess on panel side of mounting bushing	Ant. cable connection	Howard Jones S-101D	PB-43-25
26	2Z5581-2	JACK: single break contact; threaded for ⅜" hexagon nut; includes two laminated phenolic washers and nuts; mates with Plug PL-55	Jack	Chicago Tel. J-306	PB-43-34
27	2Z8788	SOCKET: SO-88, 4-contact; 10-ampere; threaded	For Plug PL-108	Precision Spec. SO-88	PB-43-24
28	3DK9017V-3.1	CAPACITOR: variable air trimmer; 1 section; 17 mmfd; 2 stator and 3 rotor plates; ceramic insulation; aluminum plates, rotors on right side behind	Detector tuning	Radio Condenser model 34-5	PB-43-23
29	3DK9150-23	CAPACITOR: fixed; ceramic; 150 mmfd, ±20%; 500 v d.c. working; negative temperature coefficient	R-F by-pass	Muter 30N680	PB-43-47
30	3DK9075-15	CAPACITOR: fixed; ceramic; 75 mmfd, ±20%; 500 v d.c. working; negative temperature coefficient	R-F by-pass for 2nd audio	Muter 20N680	PB-43-48

TABLE OF REPLACEABLE PARTS

MODEL: RADIO RECEIVER BC-357-P

REFERENCE SYMBOL	ARMY STOCK NUMBER NAVY TYPE NUMBER BRITISH REFERENCE NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION	MFR. AND DESIGNATION	DRAWING OR SPECIFICATION NO.
31	3DK9500-97	CAPACITOR: fixed; ceramic; 500 mmfd, ±10%; 500 v d.c. working; zero temperature coefficient	Cathode by-pass VT 104	Muter 20K1200	PB-43-49
32	2ZK8666-13	SOCKET: tube; octal; ceramic; steel mounting plate; 1-3/32" dia, less plate; two holes for mounting 1½" between centers	Socket for VT-153	Ucinite 115001-2	PB-43-26
	2Z6701	MOUNTING: FT-161; aluminum; 5¾" long x 5½" wide by ⅛" thick with one 1-11/16" square shock mounts containing snapslide fastener stud in each corner	Mounting	Zierold Metal Prod. FT-161	PB-43-10
	2Z3404	JACK COVER ASSEMBLY: consists of a cover support, brass nickel plated plate 1/32" thick x ⅝" O.D.	Junction jack cover	Gits. Bros. D1601	PB-43-6
	2C4341F/B1	CONNECTOR: thru panel stud; consists of two ceramic insulators 0.125" long x 0.275" dia.	Thru panel connector	Pacific Clay Prod. 34-100	PB-43-1
	2ZK1614	GRID CAP: brass, cadmium plated; ¼" deep x ¼" dia; split; two 3/32" solder lugs	Grid cap	Precision Specialty Co. GC8	PB-43-52
	2ZK9480-1	STRIP: terminal; laminated phenolic; 1 solder lug fastened vertically on one end; dimensions of strip ¾" long x ⅜" wide x 1/16" thick; mounting bracket opposite end of solder lug	Tie post	National Fab. Prod. 1510	PB-43-53
	2Z4357G.1/D1	SHIELD: capacitor dust; consists of a 9/32" long x ¼" I.D. x ⅜" O.D. black rubber base	Dust seal on capacitor shafts	Packard Bell per PB-34-101	PB-34-101
	2C4357L/S2	SHIELD: condenser; cadmium plated #20 gauge cornice copper or brass; L-shaped	Detector capacitor shield	Packard Bell PB-21-101	PB-43-5

LIST OF MANUFACTURERS AND SYMBOLS

ABC — ALLEN BRADLEY COMPANY

AC — AEROVOX CORPORATION

CEN — CENTRALAB

CMC — CINCH MANUFACTURING COMPANY

CTS — CHICAGO TELEPHONE SUPPLY COMPANY

EUC — ELECTRICAL UTILITIES COMPANY

GML — G-M LABORATORIES, INC.

HBJ — HOWARD B. JONES COMPANY

PEC — PEERLESS ELECTRIC COMPANY

PSC — PRECISION SPECIALTIES COMPANY

R — REMLER COMPANY

RCC — RADIO CONDENSER COMPANY

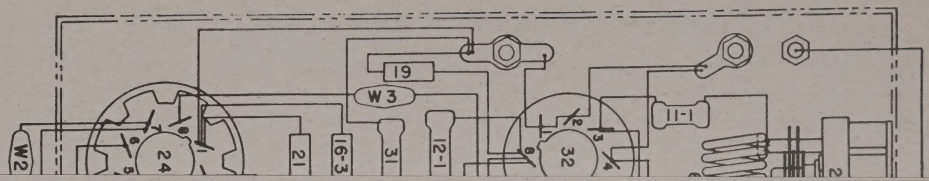
RAP — R. A. PFLEGER LABORATORIES, INC.

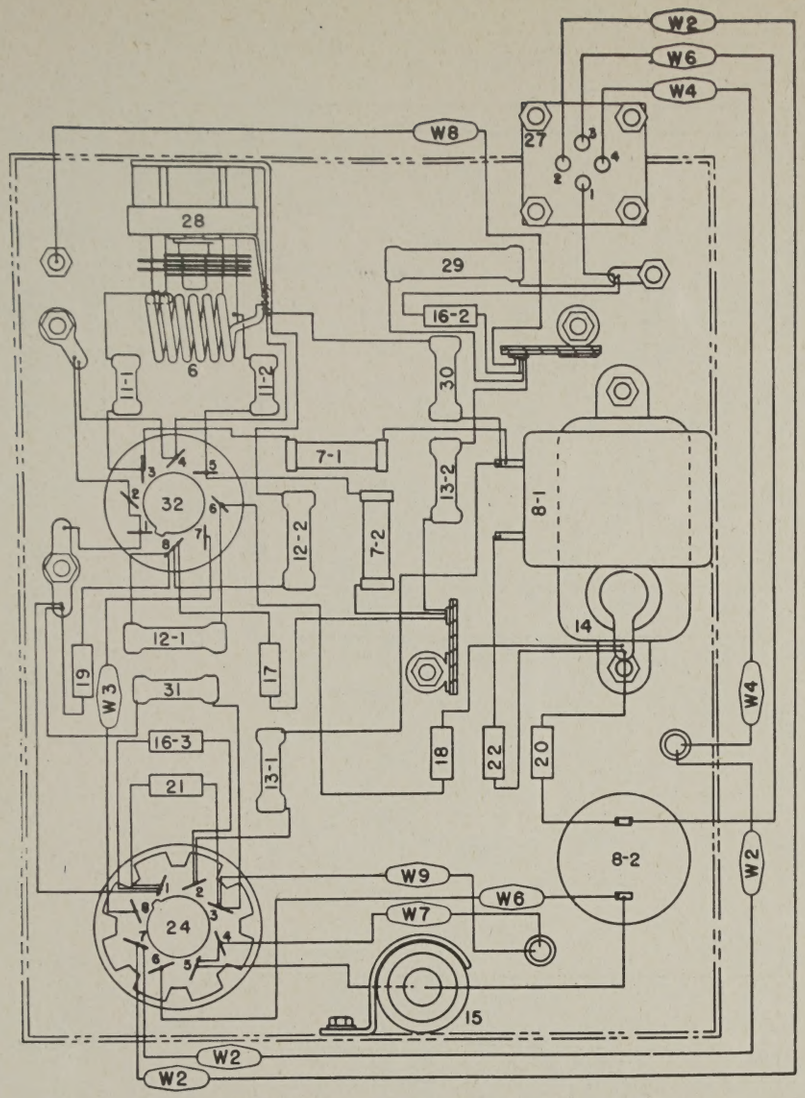
TMC — THE MUTER COMPANY

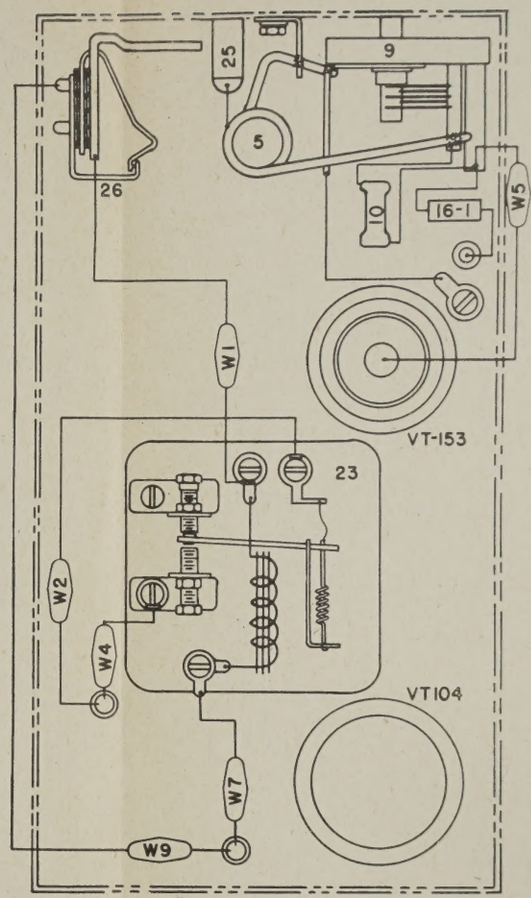
UC — UCINITE COMPANY

SCC — STACKPOLE CARBON COMPANY

ZMC — ZIEROLD METALS COMPANY


19
W3
W2
24
21
16-3
31
12-1
32
11-1
2





WIRE TABLE	
CODE	COLOR OF WIRE
W1	BLACK
W2	BROWN
W3	BROWN
W4	GREEN
W5	GREEN
W6	GREEN-YELLOW
W7	ORANGE
W8	ORANGE
W9	SLATE

NOTES:
1 FOR REFERENCE NUMBER IDENTIFICATION, REFER TO TO TABLE OF REPLACEABLE PARTS.
2. WIRES WITH NO COLOR CODE INDICATED ARE BARE OR SPAGHETTI COVERED.

FIG. 9 PRACTICAL WIRING DIAGRAM, RADIO RECEIVER BC-357-P

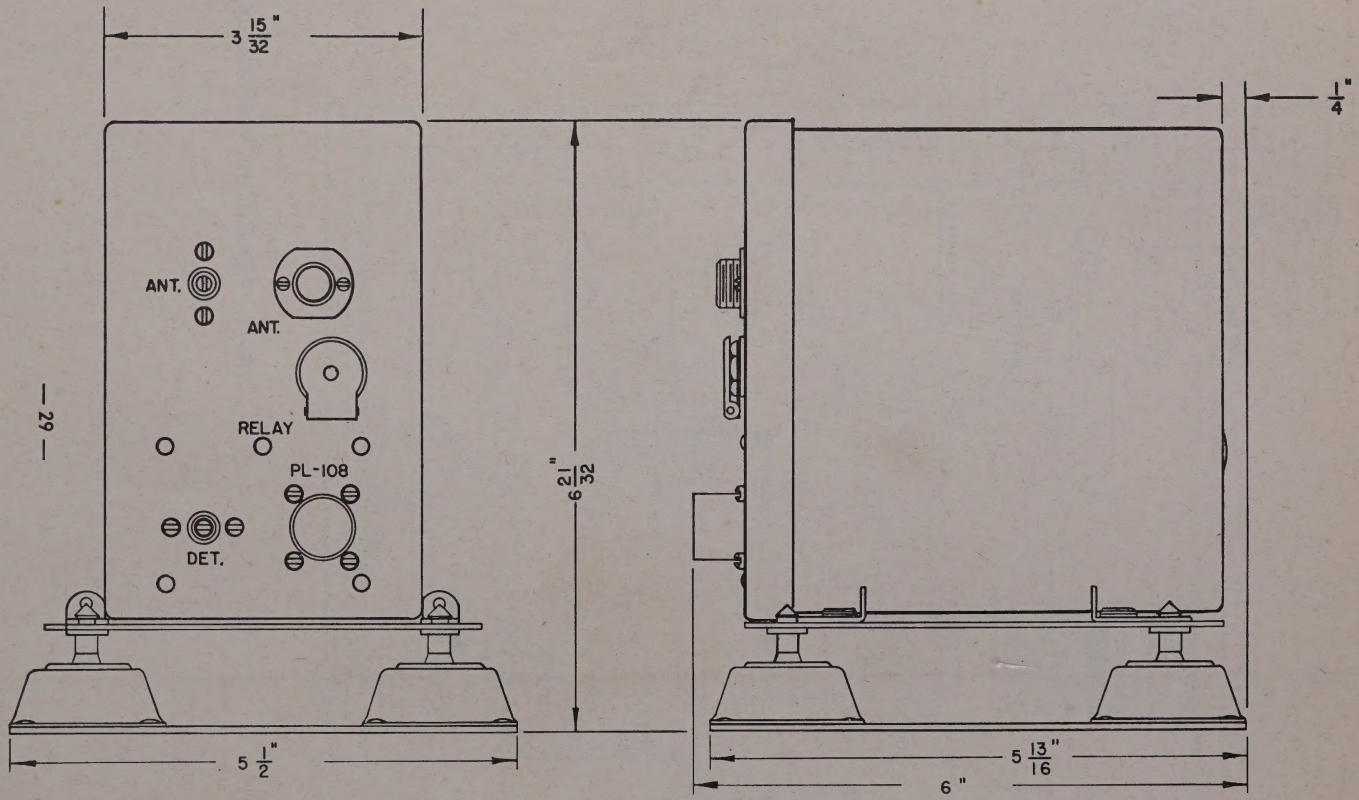


FIG. 10 RADIO RECEIVER BC-357-P, OUTLINE DIMENSIONAL SKETCH